



## Kennedy Space Center's Sustainability Initiatives

NASA's sustainability policy is to execute NASA's mission without compromising our planet's resources so that future generations can meet their needs. Sustainability involves taking action now to enable a future where the environment and living conditions are protected and enhanced. In implementing sustainability practices, NASA manages risks to mission, risks to the environment, and risks to our communities. The following projects showcase Kennedy Space Center's commitment to sustainability:

### SUSTAINABLE FACILITIES



#### Propellants North Administration and Maintenance Facility

The Propellants North Administrative and Maintenance Facility in the Launch Complex 39 area of Kennedy Space Center in Florida is NASA's second Platinum-rated by the U.S. Green Building Council's (USGBC) Leadership in Environmental and Energy Design (LEED) certification system.

It is the space agency's first carbon-neutral facility, which means it will produce enough energy on-site from renewable sources to offset what it requires to operate.

The facility's two-story administrative building houses managers, mechanics and technicians who fuel spacecraft at Kennedy. An adjacent

single-story shop is used to store cryogenic fuel transfer equipment. In the parking lot is a solar-powered parking station for alternative-fuel vehicles.



The facility, which incorporated reclaimed and processed waste concrete from Kennedy's demolition projects for the foundation and paving subbase materials, is designed to reduce energy consumption by 60 percent compared to similar traditional buildings. To do so, it has a solar water heating system, Energy Star appliances, and Xeriscape landscaping using native species and recycled crushed crawlerway rock for mulch. Propellants North also offers rainwater harvesting, storm water recycling and air conditioning with energy recovery technology. Its roof is constructed of recycled metal that is highly reflective and highly emissive, and its solar panels are set to produce 150,000 watt-hours (150 megawatt-hours) of energy per year.

#### Electrical Maintenance Facility

An 18,500-square-foot Electrical Maintenance Facility (EMF) will provide new and renovated space for maintenance shops, offices, and equipment and material storage in support of the electrical maintenance functions at Kennedy.

The EMF is projected to receive Gold certification under the LEED certification system.

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### Solar Facilities

In June 2008, Kennedy leased land to Florida Power & Light (FPL) to build a 10-megawatt photovoltaic (PV) system for FPL's electricity generation purposes. As in-kind consideration for use of the land, FPL provided Kennedy a separate 1-megawatt PV system valued at \$6.4 million. This innovative partnership helped the federal government and FPL electricity consumers achieve the environmental benefits of using electricity generated from renewable sources, and also helped NASA reduce energy costs that consume mission resources.

Kennedy's 1-megawatt facility will produce almost 1,800 megawatt-hours annually, saving NASA \$162,221 in Fiscal Year 2010 while avoiding 1,055 tons of carbon dioxide emissions annually. FPL's 10-megawatt facility will produce almost 19,000 megawatt-hours and avoid 10,306 tons of carbon dioxide emissions annually.

Between the two systems, more than 560,000 megawatt-hours of electricity will be produced saving KSC about \$10.7 million while avoiding 360,000 tons of carbon dioxide emissions during its expected 30-year life.

### INFORMATION TECHNOLOGIES

In an effort to reduce energy costs, the Kennedy Data Center (KDC) moved away from tower-based server hardware

on open shelves to rack-mounted server hardware in equipment racks that are designed to efficiently cool the systems contained within.

This has resulted in increased server cooling efficiency, decreased server energy usage, and lower instances of equipment failure due to reduced variation in component temperature. Further reduction in energy consumption was realized through this effort by eliminating all monitors associated with individual servers.

The KDC also implemented server virtualization technology resulting in a significant decrease in the number of physical servers, which has reduced the electrical power required to run and cool physical equipment. To date, 42 percent of the KDC server infrastructure consists of virtual machine servers.

Beginning in 2009, half of the lighting in the KDC was turned off resulting in a continuous annual savings of \$5,274.

Last year, the KDC implemented a new 80kVA, three-phase, 208V Power Distribution System resulting in significantly increased efficient utilization of facility-provided power. This year, the KDC will implement a second 80kVA unit.



### WASTE DIVERSION

In 2010, Kennedy achieved a solid waste diversion rate of 56.21 percent by recycling and reusing construction and office material.

Top-recycled items at Kennedy are:

- Cement and concrete (20,401,460 pounds)
- Rock or stone (5,912,640 pounds)
- Scrap metal (2,256,640 pounds)

The Coastal Revetment Project is just one example of how Kennedy's recycled materials were used to replace an old decaying system with a new sustainable one. The 2.2 mile-project incorporated 23,000 tons of concrete originating from demolished facilities, which saved about \$3 million in project material costs.



## ACQUISITION

### Food Service

Kennedy's food service providers also helped with the sustainability efforts by switching to products that are environmentally friendly.

Paper cups now are made with corn-based polylactide (PLA) lining making them 100 percent compostable and biodegradable. Napkins are made from 100 percent recycled fiber and a bleach-free process, and plastic cups are 100 percent compostable.

By using green chemical products for dish washing, Kennedy saw an increased savings of hard water usage by \$1,500 this year.

In correlation with its green goals, the center's cafeterias put waste into a pulping machine, which reduced the volume by 90 percent and weight by as much as 50 percent.

### Office Supplies

Kennedy utilizes office supplies with recyclable content provided by its vendors. Some of these include binders (25 to 30 percent recycled); tape dispensers (100 percent recycled); and Post-it Notes (30 percent recycled).

Earth-friendly products, such as hand sanitizer and cleaning solutions, also are available for use.

## TRANSPORTATION

Kennedy has excelled in the decrease of petroleum consumption in its government fleet since Fiscal Year 2005 by 2 percent each year. This effort is in line with an executive order calling for reductions in greenhouse gas emissions.

Sixty-one percent of the 1,406 vehicle fleet uses alternative-fuel, such as bio-diesel, electricity, compressed natural gas and ethanol. The fleet includes:

- 655 flex-fuel vehicles (E85)
- 101 diesel vehicles (2 Bio)
- 58 dual-fuel CNG (compressed natural gas)
- 26 dedicated CNG
- 6 gas/electric hybrid vehicles

Kennedy has installed 68 electric charging locations and six commercial charging stations around the center.

The center also has tested the following vehicles:

- Zero-emission fuel cell bus
- Fuel cell-powered vehicles
- BMW Hydrogen 7 (liquid hydrogen-fueled vehicles)





## ENVIRONMENTAL REMEDIATION

Kennedy's Environmental Remediation Program incorporates the core elements of sustainable green remediation into projects, when feasible, primarily through the use of alternative power and bioremediation.

Through the use of cutting-edge cleaning methods, environmentalists successfully decontaminated groundwater at nine Kennedy sites. At the GSA Seized Property Yard, bioremediation saved an estimated \$400,000 compared to a traditional pump-and-treat system.

### Bioremediation Benefits

- Small carbon footprint and minimal habitat disturbance
- Readily mobile and reusable system
- Naturally occurring processes

Remediation also included the use of solar power for recirculation systems at Launch Pad 39B, the Hydrocarbon Burn Facility, former Drum Storage Area and GSA Seized Property Yard.

## HISTORICAL EFFORTS

### Incorporating History into the Future

Kennedy is taking steps to utilize its historical features for future missions. Examples include crushed crawlerway rocks as a substitute for mulch, a new mobile launcher atop an old crawler-transporter, and keeping the concrete base of Launch Pad 39B intact while modifying its structure for multiple users.

The Propellants North Administration and Maintenance Facility also incorporated early Launch Control Center firing room windows and frames inside the facility. Bow trusses also were used inside the facility and as part of the solar-powered charging canopy area.

## Operations and Checkout Building

The Operations and Checkout Building is listed as a historic property under the National Historic Preservation Act. Before modifying the building's high bay in support of NASA's Orion Project, regulatory requirements were met. Specialized cameras and equipment were used to collect footage of the building and mitigation measures were taken to protect the Shuttle Cargo Integration Test Equipment stands and rails, and the Apollo Test Mount Clean Room.

## NATURAL RESOURCES

### Secondary Dune, Launch Pad 39B

A secondary dune now acts as a reservoir of sand to replenish and maintain the shoreline along a critical area of Kennedy's Launch Complex 39. The dune provides an essential habitat for threatened and endangered species found only at Kennedy.

The dune also provides shielding from Launch Complex 39 exterior lights, to help reduce disorientation to nesting and hatchling sea turtles.

The dune consists of about 24,000 cubic yards of sand with 8,000 cubic yards provided free from the Air Force at Cape Canaveral Air Force Station.

### Prescribed Burn Program

Prescribed burns are used to reduce fuel loads and maintain a viable habitat for the endangered Florida Scrub Jay. Kennedy is one of only three viable Scrub Jay habitats remaining.

The burns also promote new plant growth and reduce the potential for wildfires.

